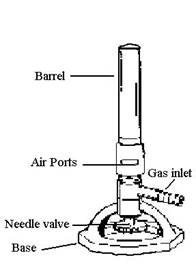
**The Bunsen Burner Experiment** Name \_\_\_\_\_\_\_\_\_\_\_Key\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The Bunsen burner is commonly used to burn fuel gas in the lab for the purpose of heating. As you will be using this tool from time to time in your experiments, you should know something about it.

In our school the fuel for the burner is natural gas, which is largely odorless, colorless methane, CH4. Three important chemical changes can occur when methane is burned. Note that the product formed depends on the amount of oxygen present when the reaction takes place.

**Safety Note:** Always wear safety goggles when working around a lighted burner and secure long hair.

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| The Luminous (Glowing) Flame | Observations |
| 1. Screw the **barrel** down so that no air can enter the **air ports**. Turn **gas spigot** so that it is parallel to the nozzle. Light the burner and adjust the valve so that you have a small steady flame. | Billowy, orange flame |
| 1. Pass your hand quickly through the middle of the flame. (This can be done without pain as long as you have followed the directions in step one.) | Warm |
| 1. Hold a piece of glass tubing with a clothes pin so that the end of the glass is in the tip of the flame for about one minute. Remove and describe the tubing. | The tube becomes coated with a black substance. |
| 1. Increase the flow of gas by turning the needle valve at the bottom of the burner clockwise. Rest one end of the glass tubing in the top of the barrel so that the tip just enters the barrel. Angle the glass tubing away from the flame and try to light the outside end of the tubing using a match. | When the end of the tube is lit, a small flame comes out the end of the tube. |
| 1. Remove the tubing from the barrel. Holding the tubing parallel to the bench top, place one end of it in the middle of the flame. Try to light the opposite end with a match. | The tube does not light. |

Day One Procedure:

1.

Gas

3.

4.

5.

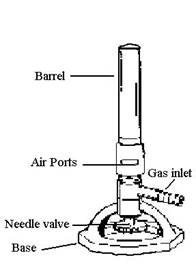
Day One Questions:

1. Which of the three equations given in the introduction accounts for your observations in step #3? Explain your choice.

#1. The black substance that was deposited on the glass tube in step 2 was carbon, a product of the first reaction.

1. Based on your observations in step #4, is there any burning taking place inside the barrel of the burner? Explain your answer.

No. If there was burning inside the barrel then a flame would have come through the tube. There would be fire in the tube and the end of the tube would not have had to be lit to produce a flame.



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| The Bunsen Flame | Observations |
| 1. With the flame still burning, unscrew the barrel of the burner at its based so that the air can enter through the air ports. Continue to unscrew the barrel until a **well-defined zone** appears in a completely blue flame. Check with Mrs. Pav before continuing | There are two flames. A smaller light blue one at the center and a larger darker blue/orange flame on the outside. |
| 1. Hold a piece of glass tubing at the very tip of the flame for one minute. | The tip glows orange/red. |
| 1. Rest one end of the glass tubing in the top of the barrel so that the tip just enters the barrel. Angle the glass tubing away from the flame and try to light the outside end of the tubing using a match. | A flame resembling the burner flame is produced at the end of the tube. |

Day Two Procedure:

1.

2.

3.

|  |  |
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| 1. With one end of a copper wire in a cork, place the other end in the flame at the six locations marked on the diagram. After 20 seconds at each location, note the color of the wire while it is in the flame. Write this color at the end of each line. Try to find a place in the flame where the copper wire will melt. | No Change  Red  Red  Orange  Yellow/orangee  No Change |
| 1. Rest the thin edge of a wooden splint the top of the Bunsen burner barrel. Allow it to burn for 5-10 seconds. Sketch what you see in the adjacent box. |  |

Day Two Questions:

1. Based on your observations in #2, can the equation which accounts for the luminous flame be used for the Bunsen Flame? Explain your answer.

No. There was no carbon deposited on the glass tube. Also, with the air ports fully opened, the maximum amount of oxygen was flowing through the burner. In the first equation, oxygen is limited.

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| Copper appears faint red | 500oC |
| Copper appears bright red | 650oC |
| Copper appears orange-yellow | 900oC |
| Copper Melts | 1083oC |

1. Use this chart to answer the following questions
2. Where is the hottest part of the Bunsen flame?

Tip of the inner flame

1. Where is the coolest part of the Bunsen flame?

Base of the flame (top of the Bunsen burner)

1. Is estimating the temperature of the Bunsen flame an observation or an interpretation? Explain.

An interpretation. An observation of temperature in which a quantitative value was measured would involve the use of a thermometer.